**Part 1 (Overall Logit Regression)**

> logit1 <- glm(PersonalLoan ~ Age + CCAvg +CDAccount +CreditCard +Education

+ + Experience + Family + Income + Mortgage + Online + SecuritiesAccount +

+ ZIP.Code, family=binomial(logit), data=Dataset)

Call:

glm(formula = PersonalLoan ~ Age + CCAvg + CDAccount + CreditCard +

Education + Experience + Family + Income + Mortgage + Online +

SecuritiesAccount + ZIP.Code, family = binomial(logit), data = Dataset)

Coefficients:

Estimate Std. Error z value Pr(>|z|)

(Intercept) -11.826868486 4.119433376 -2.871 0.00409 \*\*

Age -0.053537867 0.061309898 -0.873 0.38254

CCAvg 0.124026985 0.039648998 3.128 0.00176 \*\*

CDAccount 3.823990232 0.324308999 11.791 < 2e-16 \*\*\*

CreditCard -1.119738189 0.204972411 -5.463 0.0000000468 \*\*\*

Education 1.735968471 0.115076845 15.085 < 2e-16 \*\*\*

Experience 0.063669466 0.060926887 1.045 0.29602

Family 0.695839386 0.074310509 9.364 < 2e-16 \*\*\*

Income 0.054581665 0.002620227 20.831 < 2e-16 \*\*\*

Mortgage 0.000473575 0.000554289 0.854 0.39289

Online -0.675100462 0.157078748 -4.298 0.0000172465 \*\*\*

SecuritiesAccount -0.937144530 0.285867076 -3.278 0.00104 \*\*

ZIP.Code -0.000003948 0.000040769 -0.097 0.92286

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

**Removed, statistically non-significant variables: Age, experience, mortgate, and zipcode**

**Part 2: ran Logit to look at significance**

Call:

glm(formula = PersonalLoan ~ CCAvg + CDAccount + CreditCard +

Education + Family + Income + Online + SecuritiesAccount,

family = binomial(logit), data = Dataset)

Coefficients:

Estimate Std. Error z value Pr(>|z|)

(Intercept) -13.224197 0.562495 -23.510 < 2e-16 \*\*\*

CCAvg 0.113713 0.039265 2.896 0.00378 \*\*

CDAccount 3.853311 0.323447 11.913 < 2e-16 \*\*\*

CreditCard -1.123683 0.205003 -5.481 0.0000000422 \*\*\*

Education 1.704116 0.112393 15.162 < 2e-16 \*\*\*

Family 0.690388 0.074201 9.304 < 2e-16 \*\*\*

Income 0.054721 0.002589 21.133 < 2e-16 \*\*\*

Online -0.667476 0.156717 -4.259 0.0000205232 \*\*\*

SecuritiesAccount -0.934627 0.284849 -3.281 0.00103 \*\*

**All significant, ran vif for colinearity**

vif(logit2)

CCAvg CDAccount CreditCard Education

1.405262 2.069177 1.402360 1.825068

Family Income Online SecuritiesAccount

1.314009 2.390156 1.127723 1.364530

**None greater than 10. Therefore no co-linearity**

**Part 3: Run with interactions**

pt1interact <- glm(PersonalLoan ~ (CCAvg + CDAccount + CreditCard +

+ Education + Family + Income + Online + SecuritiesAccount)^2,

+ family=binomial(logit), data=Dataset)

glm(formula = PersonalLoan ~ (CCAvg + CDAccount + CreditCard +

Education + Family + Income + Online + SecuritiesAccount)^2,

family = binomial(logit), data = Dataset)

Coefficients:

Estimate Std. Error z value Pr(>|z|)

(Intercept) 5.820337 2.294076 2.537 0.01118 \*

CCAvg 1.048238 0.414846 2.527 0.01151 \*

CDAccount 3.097003 4.040906 0.766 0.44343

CreditCard 1.353082 1.933333 0.700 0.48401

Education -8.561181 1.135719 -7.538 4.77e-14 \*\*\*

Family -2.743498 0.638150 -4.299 1.71e-05 \*\*\*

Income -0.146530 0.018718 -7.828 4.94e-15 \*\*\*

Online 1.045496 1.570671 0.666 0.50564

SecuritiesAccount -1.825953 3.891973 -0.469 0.63896

CCAvg:CDAccount -0.311507 0.334806 -0.930 0.35216

CCAvg:CreditCard 0.133442 0.207591 0.643 0.52035

CCAvg:Education 0.476491 0.103721 4.594 4.35e-06 \*\*\*

CCAvg:Family 0.186240 0.082719 2.251 0.02436 \*

CCAvg:Income -0.012873 0.002095 -6.144 8.07e-10 \*\*\*

CCAvg:Online -0.242486 0.154759 -1.567 0.11715

CCAvg:SecuritiesAccount 0.123470 0.316324 0.390 0.69629

CDAccount:CreditCard -1.056723 2.350190 -0.450 0.65298

CDAccount:Education 0.540190 0.754995 0.715 0.47431

CDAccount:Family 1.199274 0.629766 1.904 0.05687 .

CDAccount:Income 0.002096 0.020288 0.103 0.91771

CDAccount:Online 1.146558 2.369789 0.484 0.62851

CDAccount:SecuritiesAccount 1.535694 2.511352 0.612 0.54087

CreditCard:Education -0.554398 0.434233 -1.277 0.20170

CreditCard:Family -0.234643 0.334806 -0.701 0.48341

CreditCard:Income -0.002735 0.011968 -0.229 0.81925

CreditCard:Online -4.097039 1.566738 -2.615 0.00892 \*\*

CreditCard:SecuritiesAccount -0.904872 1.803973 -0.502 0.61595

Education:Family -0.839513 0.148548 -5.651 1.59e-08 \*\*\*

Education:Income 0.101813 0.009540 10.672 < 2e-16 \*\*\*

Education:Online -0.160269 0.348705 -0.460 0.64579

Education:SecuritiesAccount 0.113891 0.739030 0.154 0.87752

Family:Income 0.045637 0.005390 8.466 < 2e-16 \*\*\*

Family:Online -0.381132 0.275576 -1.383 0.16665

Family:SecuritiesAccount -1.343882 0.675385 -1.990 0.04661 \*

Income:Online 0.007492 0.008950 0.837 0.40253

Income:SecuritiesAccount 0.025300 0.023444 1.079 0.28051

Online:SecuritiesAccount -2.634036 1.969472 -1.337 0.18108

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There are 8 statistically significant interactions

1. CCAvg:Income -0.012873 0.002095 -6.144 8.07e-10 \*\*\*
2. Education:Family -0.839513 0.148548 -5.651 1.59e-08 \*\*\*
3. Family:Income 0.045637 0.005390 8.466 < 2e-16 \*\*\*
4. CreditCard:Online -4.097039 1.566738 -2.615 0.00892 \*\*
5. Family:SecuritiesAccount -1.343882 0.675385 -1.990 0.04661 \*
6. CreditCard:Online -4.097039 1.566738 -2.615 0.00892 \*\*

**Part 4: Rerun Logit model with significant main effects and significant interactions**

> interact\_final <- glm(PersonalLoan ~ CCAvg + CDAccount + CreditCard +

+ Education + Family + Income + Online + SecuritiesAccount + CCAvg\*Income +

+ Education\*Family + Family\*Income + Family\*SecuritiesAccount

+ +CreditCard\*Online, family=binomial(logit), data=interact\_final)

> summary(interact\_final)

Call:

glm(formula = PersonalLoan ~ CCAvg + CDAccount + CreditCard +

Education + Family + Income + Online + SecuritiesAccount +

CCAvg \* Income + Education \* Family + Family \* Income + Family \*

SecuritiesAccount + CreditCard \* Online, family = binomial(logit),

data = interact\_final)

**Estimate Std. Error z value Pr(>|z|)**

(Intercept) -23.713543 1.649077 -14.380 < 2e-16 \*\*\*

CCAvg 2.112701 0.200155 10.555 < 2e-16 \*\*\*

CDAccount 6.440083 0.672466 9.577 < 2e-16 \*\*\*

CreditCard -0.230272 0.290016 -0.794 0.42720

Education 4.690231 0.337941 13.879 < 2e-16 \*\*\*

Family 1.813607 0.485942 3.732 0.00019 \*\*\*

Income 0.074305 0.009012 8.245 < 2e-16 \*\*\*

Online -0.059958 0.210390 -0.285 0.77566

SecuritiesAccount 0.090809 0.760388 0.119 0.90494

CCAvg:Income -0.013646 0.001342 -10.170 < 2e-16 \*\*\*

Education:Family -1.161186 0.118870 -9.769 < 2e-16 \*\*\*

Family:Income 0.014897 0.003171 4.698 2.62e-06 \*\*\*

Family:SecuritiesAccount -0.806026 0.337774 -2.386 0.01702 \*

CreditCard:Online -4.594695 0.727540 -6.315 2.69e-10 \*\*\*

AIC: 858.48